STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

Washington State Energy Code Development

Standard Energy Code Proposal Form

May 2018

Log No. _____

Code being amended: ☒ Commercial Provisions ☐ Residential Provisions

Code Section # C406.13 – Appendix M plumbing sizing for DCW/DHW

Brief Description:

Provides path to a C406.13 credit for the installation of a domestic water supply piping system using UPC Appendix M criteria (currently adopted by Seattle). Language in this credit assumes Washington State will amend the 2018 UPC to adopt Appendix M, and will therefore be referenceable for this code section.

Proposed code change text: (Copy the existing text from the Integrated Draft, linked above, and then use underline for new text and ~~strikeout~~ for text to be deleted.)

C406.13 – High performance domestic water distribution systems for Group R-1 and R-2 occupancies. The building domestic water piping system shall be designed in accordance with Appendix M of the 2018 Uniform Plumbing Code with Washington State Amendments.

TABLE C406.1
EFFICIENCY PACKAGE
CREDITS

Code Section	Commercial Building Occupancy					
	Group R-1	Group R-2	Group B	Group E	Group M	All Other
	Additional Efficiency Credits					
1. More efficient HVAC performance in accordance with Section C406.2	2.0	3.0	3.0	2.0	1.0	2.0
2. Reduced lighting power: Option 1 in accordance with Section C406.3.1	1.0	1.0	2.0	2.0	3.0	2.0
3. Reduced lighting power: Option 2 in accordance with Section C406.3.2[a]	2.0	3.0	4.0	4.0	6.0	4.0
4. Enhanced lighting controls in accordance with Section C406.4	NA	NA	1.0	1.0	1.0	1.0
5. On-site supply of renewable energy in accordance with C406.5	3.0	3.0	3.0	3.0	3.0	3.0
6. Dedicated outdoor air system in accordance with Section C406.6[b]	4.0	4.0	4.0	NA	NA	4.0

7. High performance dedicated outdoor air system in accordance with Section C406.7	4.0	4.0	4.0	4.0	4.0	4.0
8. High-efficiency service water heating in accordance with Sections C406.8.1 and C406.8.2	4.0	5.0	NA	NA	NA	8.0
9. High performance service water heating in multi-family buildings in accordance with Section C406.9	7.0	8.0	NA	NA	NA	NA
10. Enhanced envelope performance in accordance with Section C406.10[c]	3.0	6.0	3.0	3.0	3.0	4.0
11. Reduced air infiltration in accordance with Section C406.11 [c]	1.0	2.0	1.0	1.0	1.0	1.0
12. Enhanced commercial kitchen equipment in accordance with Section C406.12	5.0	NA	NA	NA	5.0	5.0 (Group A-2 only)
13. Appendix M plumbing sizing for DCWDHW	**2.0**	**2.0**	**NA**	**NA**	**NA**	**NA**

a. Projects using this option may not use Item 2.
b. This option is not available to buildings subject to the prescriptive requirements of Section C403.3.5.
c. Buildings or building areas that are exempt from thermal envelope requirements in accordance with Sections C402.1.1 and C402.1.2 do not qualify for this package.

Purpose of code change:

Reduce pipe sizing saving embodied energy and embodied carbon while conserving natural resources. Additionally, saving service hot water heating and recirculating energy.

Projects pursuing this credit are anticipated to result in the reduction of GPM requirements. Reduction in pipe diameter and flows for the domestic hot water system will result in a direct energy savings from reduced heat loss. Reduction in pipe diameter of the hot & cold water distribution system inherently lowers the carbon footprint of the piping system as a whole, when considering manufacture and transport of piping materials. The primary energy savings are associated with reduced diameter water service entrances, interior cold water mains / branches, interior hot water mains / branches, fittings, labor, and appurtenances. These design changes will also improve water quality and safety; as well as save energy, water, and reduce utility bills for the entire life of the plumbing system.

Your amendment must meet one of the following criteria. Select at least one:

☐ Addresses a critical life/safety need.

☐ The amendment clarifies the intent or application of the code.

☒ Addresses a specific state policy or statute.
(Note that energy conservation is a state policy)

☐ Consistency with state or federal regulations.

☐ Addresses a unique character of the state.

☐ Corrects errors and omissions.

Check the building types that would be impacted by your code change:

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☐ Single family/duplex/townhome ☒ Multi-family 4 + stories ☐ Institutional

☐ Multi-family 1 – 3 stories ☐ Commercial / Retail ☐ Industrial

Your name	Anton Leitner	Email address	antonl@rushingco.com
Your organization	Rushing Company	Phone number	206-285-7100
Other contact name	Eric Vander Mey		

Instructions: Send this form as an email attachment, along with any other documentation available, to: sbcc@des.wa.gov. For further information, call the State Building Code Council at 360-407-9278.

Economic Impact Data Sheet

Briefly summarize your proposal's primary economic impacts and benefits to building owners, tenants and businesses.

Cost savings due to reduction in pipe sizes.
Water and energy savings due to reduction in pipe sizes.

Provide your best estimate of the construction cost (or cost savings) of your code change proposal? (See OFM Life Cycle Cost **Analysis tool** and **Instructions;** use these **Inputs**. **Webinars on the tool can be found Here and Here**)

$Click here to enter text./square foot (For residential projects, also provide $Click here to enter text./ dwelling unit)

Show calculations here, and list sources for costs/savings, or attach backup data pages

As this is a proposed change to the C406 section this is an option that an owner can pursue if they choose this option and determine that it is cost effective. Therefore, cost analysis information has not been provided as it is not a mandatory requirement of the code.

Therefore, only information is provided as to the energy and/or carbon emissions savings. The Energy Code TAG may need to adjust the number of credits for based on final code language for this credit or other credits.

Provide your best estimate of the annual energy savings (or additional energy use) for your code change proposal?

0.123 KWH/ square foot (or) Click here to enter text.KBTU/ square foot

(For residential projects, also provide Click here to enter text.KWH/KBTU / dwelling unit)

Show calculations here, and list sources for energy savings estimates, or attach backup data pages

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.

Per the *Multifamily Billing Analysis: New Mid-Rise Buildings in Seattle* report Ecotope produced for Seattle in 2009, 25% of total building energy use was for DHW, and 20% of useful DHW heat is lost due to circulation and distribution losses:

Energy bills were divided into primary end uses and were found to have roughly the following average distribution:

- 25% for domestic hot water (DHW)
- 25% for non-heating electrical use in the apartments
- 25% for non-heating electrical use in the common residential spaces
- 25% for space heating – of which
  - half is used in the apartment units and
  - half is used in the common area corridors and lobbies

Table 1: Normalized Energy Use (kWh/ft^2/yr)*, Averages for 10 Multifamily Buildings

Building	DHW	Residential Space Heat	Common Area Space Heat	Common Area Other	Residential Other	All
Average	3.07	1.8	1.25	3.28	2.8	12.2
Median	3.08	1.2	1.43	2.89	2.84	11.44
Aggregate Ratio[1]	2.8	1.2	1.23	2.96	2.8	10.99

* Includes all gas and electric energy reported as simple energy units of kWh. To convert to kBtu multiply by 3.413 kBtu/kWh.

Since most of the domestic hot water systems are central water heaters, more than 60% of all the energy use in these buildings is *not* in the apartment units. The major end uses evaluated were divided into several categories:

DHW: All but one of these buildings has a central gas-fired hot water system. When present, these systems are the single largest energy consumers in the building. Most of these systems are 80% efficient boilers and another 20% of the heat energy is lost in the continuously circulating distribution system. More research and design alternatives are needed to reduce hot water use and distribution losses.

Assuming average annual efficiency of 80% on the boilers, the net annual DHW LOAD would be 3.08 kWh/ft^2/yr *0.8 = 2.464 kWh/ft^2/yr. The 20% that is lost in recirculation equates to 2.464 kWh/ft^2/yr * 0.2 = 0.493 kWh/ft^2/yr.

As an estimate we are assuming the pipe diameters drop by 25% due to Appendix M calcs, and pipe surface area has a linear relationship to diameter, thus heat loss should reduced by the same ratio.

Thus the circulation loss load drops from 0.493 kWh/ft^2/yr to 0.370 kWh/ft^2/yr, a savings of 0.123 kWh/ft^2/yr

List any code enforcement time for additional plan review or inspections that your proposal will require, in hours per permit application:

None anticipated.

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.